CHROMOSOME NUMBERS IN THE COMPOSITAE II. MEIOTIC COUNTS FOR FOURTEEN SPECIES OF BRAZILIAN COMPOSITAE[1]

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The junior author of this paper spent 5 months during 1958-59 in south-central Brazil collecting *Cassia* material in connection with a doctoral thesis problem. Since he was routinely collecting bud material of various species of this genus and shipping these air mail to the senior author for meiotic examination, he was able to include, as time and opportunity permitted, occasional bud collections of the family Compositae. The present contribution summarizes the results of a study of this latter material.

METHODS

Chromosome counts were made from pollen mother cell squashes. Buds were collected from plants growing in the field and placed in a freshly mixed solution of 4 parts chloroform; 3 parts absolute alcohol; 1 part glacial acetic acid and allowed to remain for a period varying from several hours to several weeks. All collections were sent air mail from Brazil to Texas where the young anthers were subsequently removed and squashed in acetocarmine. Camera lucida drawings were made at an initial magnification of ca. 2,000 diameters. Voucher specimens (Table 1) are deposited in the University of Texas Herbarium.

OBSERVATIONS

Eupatorieae — The count for *Adenostemma brasilianum* (n=5) is the lowest so far reported for the tribe Eupatorieae. Mangenot *et al.*, (1957), reported an African species of this genus as $2n$=20. Apparently the basic number of the genus is x=5.

Eupatorium is a large genus with perhaps 400-500 species, widely distributed in the tropical and subtropical regions of the world with relatively few species extending into temperate regions. The two counts reported in the present paper are both in accord with the basic number, x=10. *E. kleinioides* (n=20) is apparently a tetraploid; however its meio-

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tic configurations, as shown in figure 1, are exceptional in that both asynaptic and paired chromosomes are seen at metaphase I. Paired chromosomes (bivalents), as determined by observations of a number of cells, varied from 4 to 7. Occasional trivalent associations were also seen. Apomixis has been suspected for other polyploid species of *Eupatorium* (Turner and Ellison, 1960; Turner and Beaman, unpubl.), but in such cases meiotic chromosomes have been completely asynaptic. It is possible that *E. kleinioides* is part of an apomictic complex such as exists in the species, *Bouteloua curtipendula* (Harlan, 1949).

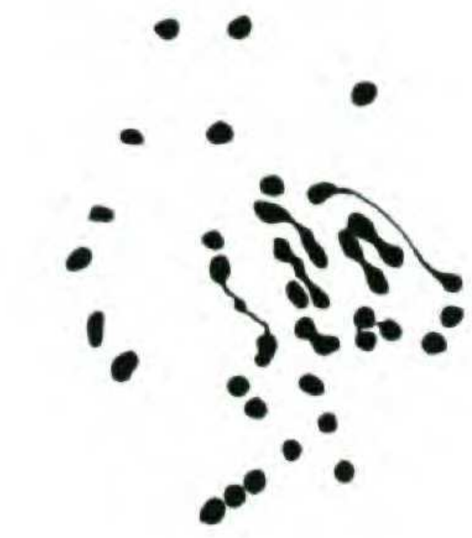
Astereae — *Baccharis* is a large, predominantly woody, genus with approximately 600 species widely distributed in the tropical and subtropical regions of the New World (Luis, 1958). Including the present reports, 9 species have been counted (Darlington and Wylie, 1956); all have been diploid with $2n=18$.

Although no certain count could be obtained for *Erigeron maximus* ($n=40\pm4$) it seems significant to report this number, the highest count reported for the approximately 25 species so far investigated. *E. maximus* is the single species of the section Leptostelma and probably has the largest plants of any species in the genus; field notes on the voucher collection reads as follows: "Stout [perennial] herb to 2½ meters." According to label data on another Brazilian collection (*Y. Mexia 4341*, TEX) the species, in certain habitats, reaches 4 meters in height.

Heliantheae — *Acanthospermum australe* ($n=11$) is a weedy species of wide distribution. Carlquist (1954) reported meiotic counts from Hawaiian collections as $n = 10$. Metaphase plates, from which the present counts were made, were particularly clear (figure 3).

Chromosome counts for *Ambrosia* ($n = 18$) and *Cosmos* ($n=24$) are consistent with those reported for other species in these genera (Wagner & Beals, 1958; Darlington & Wylie, 1956).

Chromosome counts for the closely related taxa *Wedelia* and *Wulffia* are first reports for these genera. Both belong to the subtribe Verbesininae whose genera have been characterized by high basic chromosome numbers. However, in



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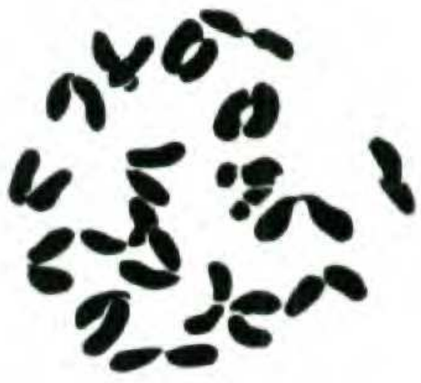

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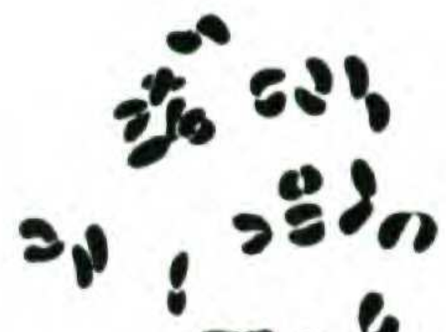

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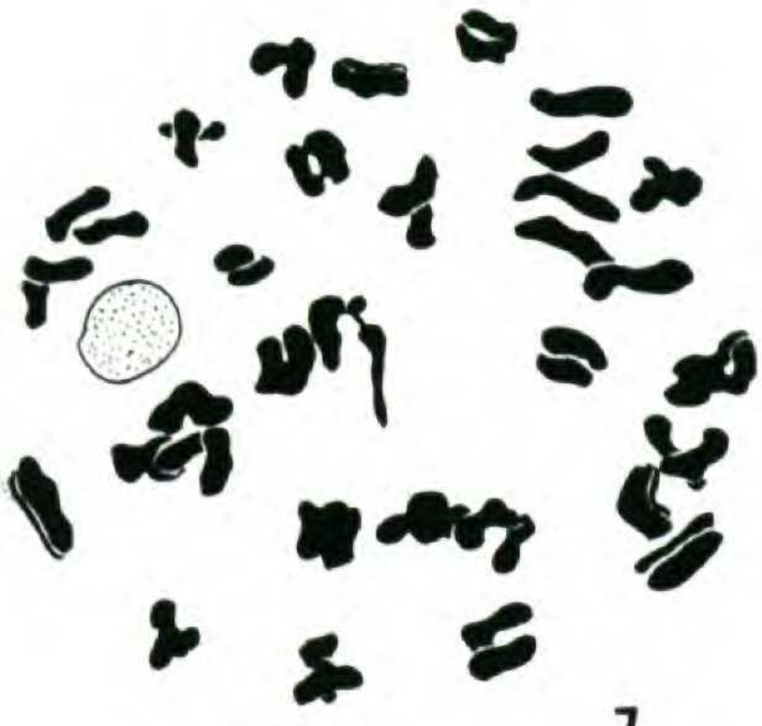

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FIGS. 1-8. Camera lucida drawings of meiotic chromosomes, all approximately 1800. Fig. 1. *Eupatorium kleinioides* ($n = 20$; 7II, 26I). Fig. 2. *Baccharis mela tomifolia* ($n = 9$; anaphase of second division). Fig. 3. *Acanthospermum austra* ($n = 11$). Fig. 4. *Ambrosia polystachya* ($n = 18$). Fig. 5. *Cosmos caudatus* ($n = 24$ Fig. 6. *Wedelia* sp. ($n = 20$). Fig. 7. *Wulffia baccata* ($n = 30 \pm 1$). Fig. 8. *Emil coccinea* ($n = 5$).

view of the numbers listed for *Wedelia* (Table 1), it appears likely that both *Wedelia* and *Wulffia* have the basic number, $x = 10$.

Senecionieae — Baldwin (1946) reported that individuals in five populations of *Emilia coccinea* in the Amazon Valley and one from southern Florida had $2n = 20$. The present count for this species, $n = 5$, is based on material collected at Belo Horizonte in South-central Brazil. Although further study is required, it would appear that two chromosome races of *E. coccinea* exist, diploid and tetraploid. It would be of considerable interest to determine if both races have been introduced from the Old World, or whether one has arisen in the New.

Cooper (1936) reported *Erechtites hieracifolia* to have a count of $2n = 40$, this being interpreted by Darlington and Wylie (1956) as indicative of a basic number $x = 10$ for the genus. The present count of $n = 20$ for *E. valerianaefolia* is in accord with Cooper's report.

TABLE 1. SPECIES OF COMPOSITAE EXAMINED FOR CHROMOSOME NUMBERS

Species	Plant Source and Voucher collection	Chromosome Number
EUPATORIEAE	BRAZIL	
Adenostemma brasilianum Cass.	Minas Gerais. *H. S. Irwin* 2700	$n = 5$
Eupatorium kleinioides H. B. K.	Goiás. *Irwin 2573.*	$n = 20$ (7 II, 26 I)
Eupatorium ligulifolium H. & A.	Minas Gerais. *Irwin 2408.*	$n = 10$
ASTEREAE		
Baccharis melastomifolia H. & A.	Minas Gerais. *Irwin 2258.*	$n = 9$
Baccharis melastomifolia H. & A.	Minas Gerais. *Irwin 2072.*	$2n = 18$
Baccharis trinervis Pers.	Minas Gerais. *Irwin 2648.*	$n = 9$
Erigeron maximus Link & Otto	Minas Gerais. *Irwin 2181.*	$n = 40 \pm 4$
HELIANTHEAE		
Acanthospermum australe (Loefl.) Ktze.	Minas Gerais. *Irwin 2138.*	$n = 11$
Ambrosia polystachya DC.	Minas Gerais. *Irwin 2125.*	$n = 18$
Cosmos caudatus H.B.K.	Minas Gerais. *Irwin 2214.*	$n = 24$
Wedelia sp.	Goiás. *Irwin 2541.*	$n = 20$
Wedelia brasiliensis (Spreng.) Blake	Minas Gerais. *Irwin 2185.*	$n = 29 \pm 1$
Wulffia baccata (L.f.) Ktze.	Minas Gerais. *Irwin 2277.*	$n = 30 \pm 1$
SENECIONIEAE		
Emilia coccinea (Sims) Sweet	Minas Gerais. *Irwin 2337.*	$n = 5$
Erechtites valerianaefolia (Wolf.) DC.	Minas Gerais. *Irwin 2066.*	$n = 20$

SUMMARY

Meiotic chromosome counts are reported for 14 collections of Brazilian Compositae. These include first reports for 13 species and 2 new generic reports (*Wedelia* and *Wulffia*). The highest count yet found for a species of *Erigeron* (*E. maximus*, $n = 40 \pm 4$) is reported. In addition, a count of $n = 11$ for *Acanthospermum australe* was found not to agree with the count of $n = 10$ reported for this weedy species from the Hawaiian Islands. — BOTANY DEPARTMENT, UNIVERSITY OF TEXAS, AUSTIN.

LITERATURE CITED

BALDWIN, J. T., Jr. 1946. Cytogeography of *Emilia* Cass. in the Americas. Bull. Torr. Bot. Club. **73:** 18-23.

CARLQUIST, S. 1954. *In* Documented chromosome numbers of plants. Madroño **12:** 210.

COOPER, G. O. 1936. Cytological investigations of *Erechtites hieracifolia*. Bot. Gaz. **98:** 348-355.

DARLINGTON, C. D. AND A. P. WYLIE. 1956. Chromosome atlas of flowering plants. MacMillan Company, New York.

HARLAN, J. R. 1949. Apomixis in side-oats grama. Amer. Jour. Bot. **36:** 495-499.

LUIS, I. T. 1958. Novum index baccharidinarum. Contrib. do Instituto Geobiologico Canoas. **9:** 1-35.

MANGENOT, S., G. MANGENOT, G. FOUTREL, AND G. DE LA MENSBRUGE. 1957. Sur les nombres chromosomiques de 150 espèces d'Angiospermes d'Afrique tropicale. Compte. Rend. Acad. Paris. **245:** 559-562.

TURNER, B. L. AND W. ELLISON. 1960. Chromosome numbers in the Compositae. I. Meiotic counts for 25 species of Texas Compositae including 6 new generic reports. Texas Acad. Sci. (in press).